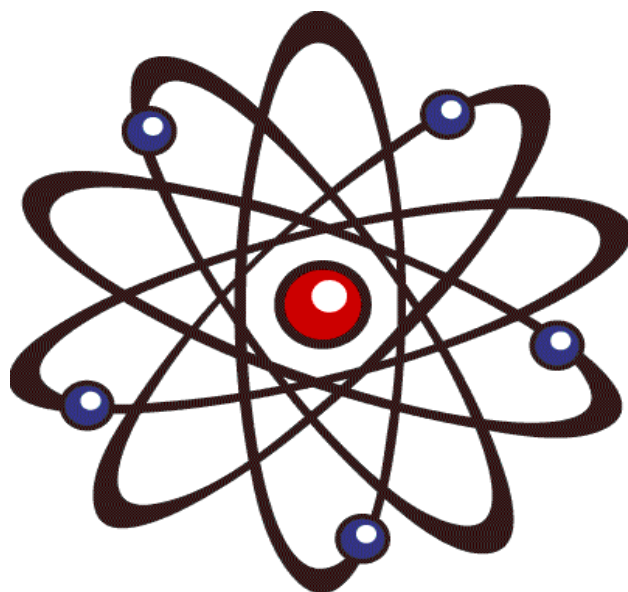




TECHNICAL BULLETIN

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SECTION I. FOCUS AREA

A Lesson on Lessons Learned from Wildland Fires at the Nevada Test Site

Submitted by Steven J. Lawrence and Robert M. Bangerter

Nevada Site Office

Background

In 2002, the Nevada Test Site (NTS) experienced a wildland fire. While only 350 acres burned, the “Egg Point” Fire caused more than \$1.2 million in damages, mostly to replace a destroyed 1.7-mile stretch of critical communication and power lines in a remote area of the site. The resulting lessons learned and corrective actions from this fire would change how the NTS managed wildland fires but would not be put to the test for three more years.

Record spring rains in 2005 created unprecedented vegetation growth across the deserts of the Southwest. For example, a spectacular wild flower bloom in nearby Death Valley generated worldwide attention for the “100-year” phenomena. The rain stopped, the vegetation set seed and dried out, setting the stage for perfect wildland fire conditions.

On Thursday evening, June 2, 2005, a series of thunderstorms moved across Southern Nevada. This marked the beginning of the 2005 wildland fire season for the area, causing the first of 31 lightning-induced wildland fires to plague the NTS over a 10-week period.

Over the course of the season, a total of 13,000 acres burned yet without damage to any site asset within the path of the fire—including power lines, communications sites, cultural areas, and key facilities—or impact to any of the legacy radiological areas that dot the site. The protection of these areas can be attributed to paying attention to the earlier lessons learned, hard work and a touch of ingenuity on the part of the NTS Fire and Rescue (F&R) department, prudent use of technology, and a well-trained and equipped Emergency Response Organization.

Lesson Learned—Focus on Early Detection and Suppression and Asset Protection

The Egg Point fire occurred in rugged terrain, inaccessible to most of the NTS F&R vehicles. While F&R did have two All Terrain Vehicles (ATV), they were used only for scouting and extraction of injured firefighters. Initially, the ATV carried only a fire extinguisher or two. By 2005, the number of ATVs was increased to six, each equipped with a “homemade” wildland fire suppression system. Created by the firefighters themselves, the system consists of parts and pieces from the compressed air foam system contained within a standard wildland firefighter backpack. Combined with a 14-gallon plastic tank with a fan tip spray nozzle, each unit has the capability to produce 25 gallons of foam per gallon of water. The ATV provide the capability to get to a fire quickly in remote areas for early suppression; to lay down foam around power poles, communication tower sites, etc.; and, to perform and patrol back-burns between areas at

risk and a fire line. The success of the ATV Wildland Fire Suppression System has attracted interest not only among area fire departments but also commercially. The vendor that supplies the wildland firefighter backpacks used in the ATV system is now marketing a device similar in concept. The number of ATVs has been increased by two in preparation for the 2006 wildland fire season.

In recognition that resources other than firefighters may be needed on the fire line, a cadre of heavy equipment operators now annually receive the eight-hour Incident Command and Wildland Fire Safety Training and are issued appropriate personal protective equipment. Operating under the direction of the Incident Commander, these drivers and their bulldozers, backhoes, water masters, etc., become part of incident response, available to plow out access roads and fire breaks, and supply water critical to the suppression effort. Another lesson learned from Egg Point was to fit the water masters with connectors compatible with fire apparatus, providing instant connect capability. The water masters are also equipped with side spray nozzles, providing additional capabilities to wet down an area at risk, such as around facilities, and along roads and power line cuts.

Another early suppression asset will also be in place before this year's fire season. A contract already exists with a local commercial helicopter service to provide flights from Las Vegas to the NTS for VIP tours and the like. The pilots have gone through the security clearance process and received access badges for this purpose. This same company is also under contract to the Bureau of Land Management (BLM) with the pilots trained and helicopters equipped to provide fire reconnaissance and suppression services. The contract for the NTS was expanded to include early detection and fire suppression activities on an as-needed call out basis. This will allow use of the service regardless of BLM involvement.

Lesson Learned—Research Local Sources and Identify Available Technology

Of the 31 wildland fires in 2005, only one required extensive external assistance. The "Air Force Fire" as it was named by the BLM, started on BLM-managed property offsite as the result of a lightning strike associated with the June 2 storms. Without early detection and suppression, the fire gained strength, eventually burning approximately 21,000 acres—92 acres of BLM-managed land, 14,181 acres of U.S. Department of Defense (DoD) land, and 6,059 acres of U.S. Department of Energy (DOE) land. At its peak, more than 500 firefighters and 8 aircraft were involved in suppression activities.

It was during the Air Force Fire that technology played a major role. Cameras with zoom capabilities are positioned across the site, used to monitor missions in progress. These were now turned towards the fire, streaming real time imagery back to the NTS Emergency Management Center (EMC) in Mercury and the NNSA Nevada Site Office (NNSA/NSO) Emergency Operations Center (EOC) in North Las Vegas. The cameras provided visual indications of smoke trails and incident scene wind shifts, allowing F&R command staff in the EMC to provide visual input to the Incident Commander regarding scene conditions he could not see. The installation of three additional cameras at key

high-elevation/high-visibility locations is in progress, in time for the 2006 fire season, with an additional four planned. The Duty Manager and/or Fire Dispatcher, located in the Operations Coordination Center (OCC) adjacent to the EMC, will be able to remotely control these cameras. The cameras are useful not only during wildland fires but will also be monitored during and after thunderstorms for early detection of lightning-caused fires.

Other technological help during the Air Force Fire included the Remote Sensing Lab (RSL)-Nellis staff performing night-time flyovers with thermo-imaging cameras, pinpointing hot spots in burned areas. Similar support came from U. S. Air Force (USAF) in the form of Unmanned Aerial Systems (UAS). This was a rare opportunity since these assets are not normally available for non-USAF mission activity. The technicians established remote monitoring capabilities in the EMC providing eye-in-the-sky real-time imagery, critical to operations planning. The benefit gained from this scarce resource gives way to investigating contract or an “on-call” type UAS capability.

Other issues from the Air Force Fire have been addressed and resolved with technological solutions. For example, maps of the test site were compartmentalized. No one map existed that showed all the hazards emergency responders might face. The Geographic Information Systems (GIS) staff at the RSL-Nellis undertook an extensive effort to update and consolidate maps. An electronic “NTS Known and Potential Hazards Map” is now in a place that provides emergency responders the ability to zoom in and zoom out or to bring up different layers, i.e., to show all surface-laid cables, power lines, known unexploded ordnance areas, bore holes and abandon mine shafts, radiological areas, facilities with hazardous material, and shot locations. Combined with a grid overlay, the map can display with accuracy Global Positioning Satellite (GPS) field data, allowing real-time plotting of key data points, such as an advancing fire line.

The Command, Control, Coordination, and Communication Visualization and Analysis System (C4VAS) is in beta testing and is scheduled to go online in May. Among other functions, C4VAS provides near real-time satellite tracking of anyone or anything equipped with a tracking device. F&R Command Staff located in the EMC in Mercury will be able to track all firefighters and vehicles responding to wildland fires. Combined with the new mapping capability, C4VAS provides the Command Staff the ability to track firefighter deployments and operations status, and also provide the Incident Commander help in promoting firefighter safety by monitoring for mapped hazards that may be invisible in the field.

Lesson Learned—Understand Communication Limitations and Develop Contingencies

The remote areas of the 1,375 square-mile test site have limited radio/cell phone coverage, which hampered communications with ground forces. In addition, the number of radios available for ground-to-air operations to direct water drops and to coordinate water pick-ups for helicopter bucket drops was inadequate. To add to the communication woes was the number of different frequencies used by responders assisting in the Air Force Fire—the same problem faced in any multi-jurisdictional

response anywhere in the Nation. Additional communications equipment has been acquired to resolve these problems, including additional radios programmed with the multiple frequencies and radios that connect to “flight deck” type helmets for better hearing protection during air-to-ground operations. Another benefit of the ATVs is that they can tow a trailer that has been equipped with a portable repeater, gasoline generator and other associated equipment to improve communications in the remote areas.

Lesson Learned—Anticipate Public Perceptions

Of primary concern during the Air Force Fire was a legacy radiological area, the result of a nuclear test conducted 40 years ago, known as the “Buggy Shot.” It lay directly in the path of the fire. While in itself, and as validated with plume models, burning over the shot site would pose little hazard in terms of radiological exposure, the public perception ramifications could hamper future missions at the site. As a precaution, air samplers were set up and/or activated not only onsite but in surrounding communities to ensure data would be available in the event the wildland fire reached the Buggy Shot site.

An all-out effort using strategically-placed firefighters, aerial water and foam drops, and state-of-the-art technology stopped the fire a mile away from the contaminated area. In preparation for the 2006 season, public affairs staff members have been trained in the eight-hour Incident Command and Wildland Fire Safety Training and issued appropriate personal protective equipment. With this training, they are more knowledgeable of wildland fire characteristics and terminology and can be part of the incident scene response with the ability to do photography and video to share with news media, better respond to media inquiries, or, as circumstances and conditions allow, serve as escorts for the media or others.

Lesson Learned—Address External Responder Issues

Use of external responders posed a unique set of problems. Security issues arose when it was identified that some of the external emergency responders—specifically, two of the aircraft pilots critical to the suppression effort—were foreign nationals. In addition, along with the inherent risks of fighting a wildland fire, the BLM firefighters were understandably concerned about the other hazards posed by the very nature of the test site. In addition to the radiological area, fighting the Air Force Fire potentially placed them in proximity to other legacy hazards, such as unexploded ordnance from military missions. Subject matter experts were deployed to the Incident Command Post to brief the external responders on these hazards and to perform radiological monitoring to alleviate their concerns. While these problems were rather quickly resolved, they did create minor delays at a critical point in the response. In time for this year’s fire season, policies exist for quickly resolving issues regarding emergency responders who are foreign nationals and a safety briefing designed specifically for external emergency responders is now in place.

In addition, it was determined that while a Memorandum of Understanding (MOU) existed between the NNSA/NSO, BLM and USAF, it was not specific enough to address

the unique problems encountered during a wildland fire—everything from funding mechanisms and radiological monitoring to the hazard briefings for external responders. A collaborative effort among these organizations (NNSA/NSO, BLM, USAF and the NTS prime contractor Bechtel Nevada) resulted in a revised MOU, addressing specific wildland fire protection issues. The MOU, approved on March 29, 2006, also has provisions for quickly elevating the national priority in acquiring offsite firefighting resources for test site fires.

The team working on the MOU also determined that another agreement was needed between NNSA/NSO and its NTS neighbor, the 99th Air Base Wing at Creech Air Force Base, which provided the UAS assets during the fire. This agreement covers the whole spectrum of emergency response and readiness including mutual assistance not only with wildland fires but also structural fires, aircraft rescue and firefighting, hazardous materials response, emergency medical services, and station back-filling operations. The agreement also addresses participation in joint training, drills and exercises; and, has a provision that allows NTS F&R to respond offsite to near-boundary fires for purposes of early suppression before the fires can spread.

Lesson Learned—Identify Weather Forecasting Assets

Because weather plays a key role in wildland fire response planning, the partnership between the NTS F&R and the Air Research Laboratory/Special Operations and Research Division (ARL/SORD) has been strengthened. In addition to the twice-daily weekday general NTS forecasts, ARL/SORD meteorologists provide alerts to NTS F&R on weather conditions that may indicate increased fire hazards. Beyond forecasting, ARL/SORD also advises on heavy rainfall events. These events have the potential to wash out access roads, which then need to be assessed for damage. SORD field staff has been trained in wildland fire safety and incident command principles. ARL/SORD's mobile weather station could be deployed near an incident to provide near-scene weather data. This capability includes surface data and the launching of weather balloons to provide upper atmospheric data, which is important in supporting aircraft operations.

Summation

The extensive vegetation growth from last year dropped seed and dried out, creating the promise of even more vegetation growth and a tinderbox situation for this year. The corrective actions from the Egg Point 2002 fire had proved their worth but the Air Force Fire of 2005 also had a few lessons to teach. The advancements made since last year should serve the NTS well in minimizing the consequences of wildland fires while the new MOUs provide a level of assurance that when the call for help goes out, it will be quickly answered.

Identification of Nuclear Safety Requirements

Submitted by Don Nichols, Office of the Chief of Defense Nuclear Safety

Background

As a result from the lessons learned from the Columbia Space Shuttle Accident, one of the actions the Department of Energy committed to was to clearly define the safety requirements and standards applicable to our operations. In September 2005, NNSA sites were asked to provide information regarding applicable DOE orders and manuals (i.e., safety requirements), exemptions to those requirements, if any, and an assessment of compliance. The sites responded late in February 2006.

Establishing a Baseline of Nuclear Safety Requirements and Exemptions

These data were used to develop a clearer picture of NNSA's Nuclear Safety Requirements Managements processes. As a result, on June 1, 2006, NNSA's Central Technical Authority (CTA) published an NA-1 Supplemental Directive entitled CTA Management of Nuclear Safety Requirements. This directive provides procedures and subordinate responsibilities in support of CTA management of nuclear safety requirements. It provides the process for obtaining CTA concurrence on changes to applicable DOE Directives as well as to the incorporation of those Directives in contracts. It also provides the process for obtaining formal guidance and expectations regarding nuclear safety requirements for use by NNSA personnel and their contractors.

The Directive is available online for those with access to the NNSA Intranet. Click on the Supplemental Directives link on the NNSA Intranet Homepage at <http://hq.na.gov/> or contact Sue Megary in the office of the Chief, Defense Nuclear Safety, at 202-586-8246 or e-mail sue.megary@nnsa.doe.gov for a copy.

SECTION II. QUESTIONS AND ANSWERS

This section is dedicated to answering questions and providing general information related to nuclear safety.

- 1. The DOE and NNSA commit a lot of resources to conducting investigations of major accidents, as per DOE O 225.1A. What is the purpose of these investigations, and what is their relevance to nuclear facility safety?*

While no one wants accidents to happen, they do occur. When the consequences of an accident during a DOE or NNSA activity exceed the thresholds defined in DOE O 225.1A, an Accident Investigation Board is chartered to evaluate the situation. The goal of the investigation is simply to determine what happened, to understand why it happened, and to recommend ways to avoid a similar accident in the future. These investigations are not intended to find fault or place blame, although sometimes that cannot be avoided. The philosophy is simple: we can learn much from our accidents, since the point of failure and its causes can usually be determined with a high degree of confidence.

Accident investigations are intensive and stressful situations for all, but are well worth the effort, given the ultimate goal. There are at least two aspects of accident investigations that are considered unique, and those aspects enable the process to be particularly successful. First, the Board is established with the independence and authority to evaluate all aspects of both the Contractor and DOE programs that the Board believes have relevance to the accident. Therefore, the Board can gain access to all relevant information, such as programmatic guidance, expectations, budgets, resource allocations, accident scene and forensic evidence; can request an interview with any involved party; and can direct independent forensic testing. Second, the investigation is not a criteria- or compliance-based assessment; the Board can equally consider whether compliance with a requirement was a concern, and whether the requirement itself was adequate to provide the level of protection necessary. As a consequence, it is not unusual for a Board to make recommendations to both the Contractor and DOE covering the entire range of activities from floor-level operations to high-level program management, policy making, and oversight.

There are also two aspects that are particularly relevant to nuclear facility safety. First, from the lessons learned perspective, all of our nuclear facilities are heavily dependent on the Contractor and DOE institutional programs. Therefore, regardless of where the accident occurred, there are likely to be lessons that can be applied to the nuclear facilities. Second, the concepts and tools used in investigating an accident are complementary to those used for determining the safety bases of our nuclear facilities. When evaluating the safety basis, analysts postulate what accidents could happen, and determine controls to prevent their occurrence or mitigate their consequences. When the accident investigation is done, one can work backwards from the actual accident, therefore allowing more understanding as to the effectiveness and adequacy of controls and mitigative actions.

The tools used by the accident investigators were designed for this application, but they could be used in other areas as well. All Facility Representatives and nuclear safety SMEs are encouraged to at least take the accident investigation training, or better yet, volunteer to participate in an accident investigation when the opportunity arises. The experience would be of exceptional value to both the participant and his or her parent organization.

[Doug Minnema, NNSA Accident Investigation Coordinator, NA-3.6. 301-903-7098]

2. *At the recent Energy Facility Contractors Group (EFCOG) meeting in Atlanta, CDNS staff talked about the risk informed decision-making project. What sites will be used in the pilot studies, and how can [my site] get involved?*

First, for those who did not attend the EFCOG meeting, some background on the NNSA Risk-Informed Decision-Making (NRID) project is in order.

The technical breadth of the facilities and activities under NNSA responsibility, the nature of their inherent risks, and the increasing need to balance the ideal of risk minimization with the goals of cost minimization and efficiency, contribute to the challenge of managing the NNSA mission. It is challenging to weigh all these considerations against competing objectives and alternatives; thus, NNSA initiated the NRID project to advance management decision-making capabilities. The objective is to develop a methodology or tool to help managers:

- Become informed of the health and safety risks associated with their decisions;
- Allocate resources, support budget requests, prioritize future resources; and
- Make complex decisions involving multiple (and potentially conflicting) objectives, criteria and attributes.

The method will consist of a structured approach that will lead to documented, consistent, transparent and defensible decisions. NRID envisions that the method could be used when considering:

- Revisions to DOE rules, regulations, and orders
- Recommendations from oversight entities
- Physical security countermeasures and mitigation systems
- Processing exemption requests
- NNSA program element priorities and actions
- Multiple decision criteria or objectives

The Chief, Defense Nuclear Safety (CDNS) will lead the project. CDNS finalized the project plan, which includes a scoping analysis of decision-making techniques used at DOE and other federal agencies, such as NASA, that evaluate risk and prioritize activities. The project plan also calls for pilot exercises and the development of risk-informed decision-making process guidance.

CDNS reviewed existing methods and selected *Expert Choice*, commercial-off-the-shelf software, to be used as the basis for the pilot NRID method. *Expert Choice* evaluates alternatives in terms of an additive preference function. That is, a function that requires subject matter experts and managers to respond to a series of comparative questions that lead to an implied numerical ranking of the alternatives as a function of each criterion or objective.

Since the initial presentation at the EFCOG meeting in Atlanta, CDNS learned that *Expert Choice* has been used successfully at some DOE sites. If your site provides examples of successful applications of decision-making techniques, CDNS may capture the processes and results of your applications in the NRID process guide. Please contact us to share your insights, or if you are interested in participating in the pilot studies or in the development of the guidance document.

For more details, please contact Sharon Steele at Sharon.Steele@nnsa.doe.gov or call 202-586-9554.

3. *What is the status of NNSA's efforts to improve the integration of nuclear safety with security?*

Implementation of security and nuclear safety requirements do not have to be exclusive of each other. BWXT Y-12 has developed a process to facilitate integration of the two disciplines, satisfying both the Design Basis Threat (DBT) expectations as well as safety basis objectives meeting 10 CFR 830, subpart B. In conjunction with and under sponsorship by the EFCOG, BWXT has taken the lead in the development of a cost effective, comprehensive approach using a multidisciplined team to enhance project integration, develop design selection, and maintain configuration control. Included in the initiative were DOE, NNSA and other contractor personnel representing security and safety programs.

A key aspect of the process is the development of a “toolbox” of key information designed to be transportable among and accessible by multiple DOE sites. Pertinent information includes safety basis and security data for various security designs, including system evaluation and approval documentation. This shared information can reduce costs associated with duplicative efforts and expedite the approval process for deployment of similar systems.

Fundamental to the successful execution of this integrated process is effective communication between security and safety basis professionals. To avoid misunderstanding, important terms and concepts used by both disciplines have been identified in a crosswalk matrix. Additionally, attention has been given to strengthening training on the project approach, selection of tools (e.g., alternate analysis methodologies), and regulatory requirements. Recognizing that the final results of facility modifications are frequently manifested in DOE-approved documentation (both

from safety basis and security standpoints), attention is given to implications of both venues, including application of the Major Modification concept.

With full recognition of the need for configuration control, a model was developed for the safety basis and security processes to proceed on separate paths, but interface at opportune points. The USQ process remains valid for determining approval authority for security changes affecting safety basis documents while another process was developed to ascertain approval authority for changes affecting security plans. Completion of both processes is a requisite for proposed changes to proceed.

The Y-12 process is being presented in a topical report on security and safety integration to be issued by EFCOG. For more details, please contact Patrick Cahalane at 301-903-2609 or Kevin Carroll at 865-576-2289, or email patrick.cahalane@nnsa.doe.gov

4. *If criticality isn't supposed to be a credible event in a facility designated as Hazard Category (HC) 3 per DOE-STD-1027-92, does that mean that a HC 3 facility would never have a criticality safety program, or need to do criticality safety evaluations? If a facility needs a criticality safety program, doesn't that mean by default it should be designated as HC 2?*

If a facility has less fissionable material than the single parameter sub-critical limits listed in ANSI/ANS-8.1 and 8.15 and the fissionable material quantities are less than the threshold values listed in DOE-STD-1027, then it may prove to be a HC 3 facility and no criticality safety program (CSP) is needed.

However, if the facility contains more fissionable material than the single parameter sub-critical limits, then a CSP is required. Nonetheless, the facility may still be shown to be HC 3 by virtue of nature of process or segmentation provided that no operational criticality safety controls or limits are needed. Appropriate elements of the CSP would be used in this case to (1) develop the analysis supporting the nature of process argument, (2) establish the criticality safety technical basis of the facility leading to bounding DSA and/or TSR controls, (3) perform annual reviews to ensure analytical and process assumptions remain valid, and (4) provide criticality safety expertise to respond to abnormal events, etc. This is addressed in DOE Order 420.1B in Chapter III, paragraphs 2–4. Specifically, a CSP that meets the expectations of Chapter III of the Order is required whenever a facility or a process exceeds the single parameter sub-critical limits listed in ANSI/ANS-8.1 and 8.15. The requirements of the Order may be graded and tailored appropriately but a HC 3 facility that has greater than the specified single parameter limits would still need a CSP. How the CSP is tailored to match the risk would be described in detail by the mandatory CSP description document that must be submitted to, and approved by, DOE. It is still possible for a facility to have greater than the single parameter limits of fissionable materials that necessitate a CSP, but yet be designated as HC 3 by virtue of an analysis of the nature of process or by crediting segmentation. A discussion of nature of process and segmentation aspects of DOE-STD-1027 was included in the June 2005 NNSA Technical Bulletin.

In summary, designating a facility HC 3 does not automatically eliminate the need for a CSP. Likewise, having a CSP does not automatically preclude a facility from being designated HC 3. If the fissionable mass limits specified in DOE Order 420.1B are exceeded, a CSP is always required.

Any questions in this area should be addressed to Dr. Jerry McKamy, 301-903-8031 or e-mail <mailto:jerry.mckamy@hq.doe.gov>.